2.0 PROPOSED ACTION AND ALTERNATIVES

This section describes the action area, the Proposed Action, and the two other alternatives that are evaluated in this EIS. Subsection 2.2, Alternatives Evaluated in Detail, summarizes the No-action, Proposed Action, and Fish Passage Alternatives. The Proposed Action would be implemented for a 50-year term. For the purposes of comparison, the other two alternatives are described for the same 50-year term. Subsection 2.3, Alternatives Considered, but not Carried Forward, summarizes additional alternatives that were considered but not carried forward to detailed evaluation.

2.1 Action Area vs. Study Area

The term "action area" as used throughout this EIS, refers to the same action area as described in the Bull Run HCP, which includes all lands located within the hydrologic boundary of the Sandy River Basin that are associated with and/or potentially affected by activities associated with the alternatives (Figure 2.1-1 shows the location of the action area). The action area includes lands owned by the City, land owned by others on which the City operates its water supply system, and lands on which the City would implement habitat conservation measures under the Proposed Action. The action area is used for the analysis of all resource areas except for Subsection 3.9, Socioeconomics and Environmental Justice. In this case, an EIS study area was used that is different from the action area and is described in Subsection 3.9.2, Affected Environment, and in Subsection 4.9.1, Analysis Methods.

2.2 Alternatives Evaluated in Detail

The following subsections summarize the No-action, Proposed Action, and Fish Passage Alternatives. Table 2.2-1 (at the end of this section) provides a comparison of each alternative.

2.2.1 Alternative 1, No-action Alternative

Under the No-action Alternative, the City would not implement its proposed Bull Run HCP and NMFS would not issue an ITP; however, the City would comply with the TMDL. No other measures included in the Proposed Action would be implemented. None of the monitoring, research, or adaptive management programs that would occur under the Proposed Action are included in the No-action Alternative. The City would operate the Bull Run water supply system as described in the following subsections.

2.2.1.1 Flow

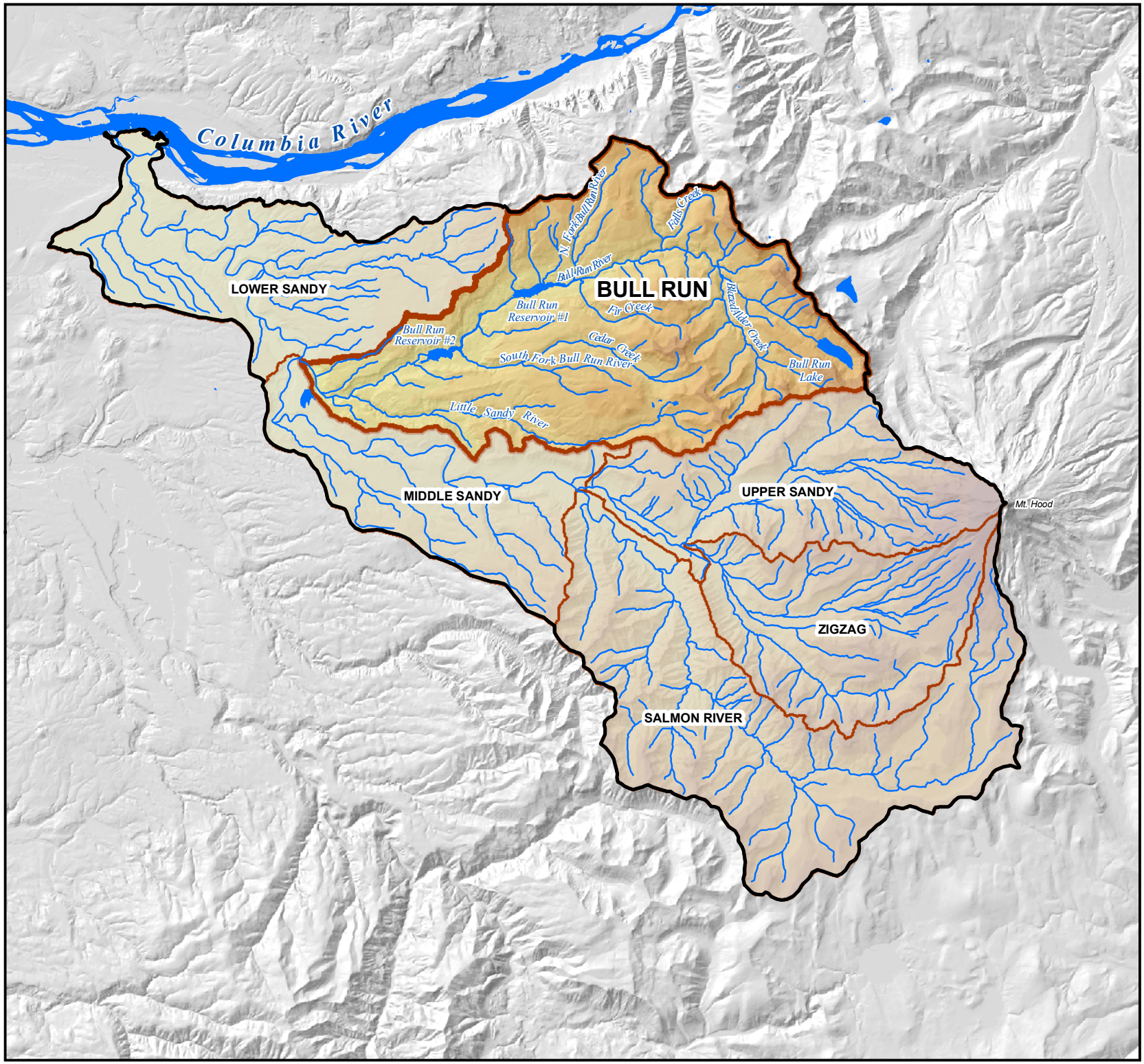
Flow management under the No-action Alternative is intended to facilitate implementation of the temperature standards described below in Subsection 2.2.1.2, Temperature. These flow requirements are summarized in Table 2.2-2 (note: flow tables are formatted to facilitate comparison among the alternatives).

Table 2.2-2 Flow commitments under the No-action Alternative for the Lower Bull Run River during all water year types, measured at USGS Gauge 14140000, RM 4.7

Time Period	Guaranteed Minimum Flow (cfs)[1]	Required Percent of Inflow (%)	Maximum Required Flow (cfs)
January 1 – May 31	None	Not applicable	Not applicable
June 1 – June 15	None	Not applicable	Not applicable
June 16 – June 30	Optimize use of cold water in the reservoirs. Vary flow from 20 cfs to 40 cfs to manage downstream water temperature based on weather conditions. Average summer flow expected to be 35 cfs.		
July 1-September 30	Optimize use of cold water in the reservoirs. Vary flow from 20 cfs to 40 cfs to manage downstream water temperature based on weather conditions. Average summer flow expected to be 35 cfs.		
October 1 – October 15	Varies 30 to 70 cfs, depending if it is a normal or critical flow year		
October 16 – October 31	Varies 30 to 70 cfs, depending if it is a normal or critical flow year		
November 1 – November 15	None	Not applicable	Not applicable
November 16 – November 30	None	Not applicable	Not applicable
December 1 – December 31	None	Not applicable	Not applicable

[1] cubic feet per second

The City has been implementing flow measures downstream of Bull Run Dam 2 on an experimental basis in order to help determine the costs and operational changes that would be required if the Bull Run HCP were approved. Flow management under the No-action Alternative would differ from the flows currently being maintained for the lower Bull Run River. In the absence of an approved HCP (i.e., under the No-action Alternative), the City would not have an obligation to continue its current



Key Boundaries

- Creeks and Streams
- Lakes and Reservoirs
- Sandy River Basin
- Sandy River Basin Watersheds

Projection:
State Plane Oregon North Feet
North American Datum 1983

N

0 2.5 5 Miles

0 4,023 8,046 Meters

Scale = 1:316,800

Sources: City of Portland, 2007;
The Oregon Geospatial Enterprise Office, 2007;
CH2M HILL, 2007.

Figure 2.1-1
Action Area
Bull Run HCP EIS

\\GLACIER\PROJ\181353_BULL_RUN\MAPFILES\FIG2.1-1_ACTIONAREA.MXD FIG2.1-1_ACTIONAREA.PDF 10/15/2007 15:10:35

experimental operations. Flow measures to manage downstream water temperature (mid June – October 31) would remain the same as current conditions (i.e., consistent with proposed HCP measure F-1 and F-2). Other flow commitments for November through May – spring and fall flow measures to optimize habitat conditions, critical year flow measures, and downramping measures – would not be continued under the No-action Alternative.

2.2.1.2 Temperature

The City's strategy for managing temperature relies on using the available cold water in the reservoirs to control temperatures in the lower river and in the water distribution system. The City stores cold water in the reservoirs in early summer when overall temperatures are lower, and releases it in the late summer when river temperatures are warmer.

Under the No-action Alternative, the City would manage temperature to maintain a 7-day moving average of the maximum daily water temperature of the lower Bull Run River below 69.8°F (21°C) for salmon/trout rearing. This is the same as Measure T-1 (pre-infrastructure temperature management) under the Proposed Action. The City chose a 69.8°F maximum target because it allows for continued salmonid growth (Sullivan et al. 2000) and because the City cannot meet a lower maximum temperature with the current water supply infrastructure. In 2005 and 2006, the City did not exceed a maximum water temperature target of 69.8°F for the lower Bull Run River.

Federal water quality standards for the lower Bull Run River designate the river as core cold water habitat. The lower Bull Run River, however, currently does not meet cold water temperature standards, and it is included on the State of Oregon's list of impaired waters (ODEQ 2005). ODEQ developed a TMDL and Water Quality Management Plan for the Sandy River Basin, including the lower Bull Run River. The TMDL established numeric temperature and natural condition temperature criteria for the lower Bull Run River. Natural condition temperature data for the Bull Run River are not available, so the Little Sandy River is used as a surrogate stream for estimating natural condition temperatures. When the estimated natural condition temperatures of the Bull Run River are at or below the numeric criteria – 60.8°F (16°C) for salmonid rearing and 55.4°F (13°C) for salmonid spawning – the numeric criteria apply. When the estimated natural condition temperatures of the Bull Run River are above the numeric criteria, the natural condition temperature criteria apply – the 7-day moving average of the daily maximum temperature of the Little Sandy River. There are exceptions to the natural condition temperature criteria, which allow temperatures to rise between 1.8 and 2.7°F (1 to 1.5°C) above the temperature of the Little Sandy River. See Appendix G of the Bull Run HCP for more information.

Full compliance with the TMDL however, would not be possible without modification to the existing infrastructure. Under the No-action Alternative, the City would modify the Dam 2 intake towers for selective withdrawal of cold water and modify the Dam 2 stilling pool and its rock weir. Both of these changes would allow more effective use of cold water stored in the reservoirs and would enable the City to meet TMDL requirements. Temperature management after the modifications are in place would be the same as described in Measure T-2 (post-infrastructure temperature management) under the Proposed Action.

2.2.2 Alternative 2, Proposed Action

Under the Proposed Action, NMFS would issue an ITP and the City would implement the Bull Run HCP. NMFS would issue an ITP for the covered activities and species as described below in Subsections 2.2.2.1, 2.2.2.2, and 2.2.2.4 (Covered Facilities, Covered Activities, and Covered Species, respectively). In addition, the City would implement compensation, avoidance, and minimization measures for impacts to covered species and their habitats consistent with the goals, objectives, and conservation strategies of the Bull Run HCP a described below in Subsection 2.2.2.6, Proposed Conservation Measures. As with the No-action Alternative, implementation of the Proposed Action would achieve compliance with the TMDL (described above in Subsection 2.2.1). Most of the other conservation measures, however, are unique to the Proposed Action. The following subsections describe the key elements of the Proposed Action; additional detail is provided in the Bull Run HCP.

2.2.2.1 Covered Facilities

Covered facilities that are owned, operated, or used by the City include, but are not limited to, the following:

- Bull Run Dam 1 and Dam 2, and associated structures
- Reservoir 1 (Lake Ben Morrow) and Reservoir 2
- Reservoir 2 spillway approach canal
- Diversion dam and pool below Dam 2
- Spillway weir and pool below Dam 2
- Reservoir log booms and other reservoir structures
- Headworks facility (screens, chlorination facility, operation equipment)

- Water supply conduits (including interties and blowoffs), bridges, and trestles, except mainstem Sandy River crossings
- Water quality monitoring stations and flow gauges in the lower Bull Run River and the Little Sandy River
- Microwave communication towers located adjacent to waterways and reservoirs
- Sandy River Station maintenance facility
- City-owned or maintained roads and other paved or graveled surfaces on non-Federal lands
- City-owned or maintained easements on non-Federal lands owned by others (e.g. water supply conduit easements on private land)
- Easements owned or maintained by others on City-owned land (e.g. Bonneville Power Administration powerline easement on City land)

2.2.2.2 Covered Activities

The City is proposing specific activities or projects for which take authorization would be provided; these are described in detail in Section 3.4 of the Bull Run HCP. The three categories of covered activities are summarized below.

Operation, Maintenance, and Repair of the Water System

The City is proposing that incidental take coverage include all activities associated with the continued operation and maintenance of the water supply system as follows:

- Storage of water in reservoirs and regulation of reservoir surface elevations
- Diversion of water for water supply
- Alteration of flows downstream from the water supply dams and diversion
- Release of water from reservoirs into the Bull Run River
- Adjustment of water intake depth to regulate temperature, turbidity, and color
- Seasonal closure of gates at the Dam 1 spillway to store additional water
- Removal of debris (including logs) from the reservoirs

- Operation of boats and barges on reservoirs
- Delivery and storage of fuel and lubricants for water supply system vehicles and equipment
- Delivery and storage and use of chlorine gas for water supply disinfection
- Draining of water supply conduits
- General landscape maintenance
- Operation, maintenance, and repair of all City facilities described above in Subsection 2.2.2.1, Covered Facilities

Habitat Conservation, Research, and Monitoring Measures

The City is proposing that incidental take coverage include all activities associated with the implementation of the habitat conservation measures and the research and monitoring measures. Any additional habitat conservation measures and monitoring measures implemented as a part of adaptive management would also be covered.

Incidental Land Management Activities

The City also seeks coverage for incidental land management activities on lands within the Sandy River Basin. These activities include management of City-owned riparian lands; maintenance and repair of City roads, bridges, culverts, parking lots, easements, and rights-of-way on non-Federal lands in the Bull Run Watershed; and operation and maintenance of the Sandy River Station maintenance facility.

2.2.2.3 Activities Not Covered by the Bull Run HCP

The City is not proposing incidental take coverage for the following water system activities: 1) operation and maintenance of City facilities at Bull Run Lake; 2) operation and maintenance of the Lusted Road Treatment Facility; 3) operation and maintenance of Dodge Park; 4) operation, maintenance, and replacement of City conduits crossing the mainstem Sandy River; 5) operation and maintenance of hydroelectric facilities at Dam 1 and Dam 2; 6) operation and maintenance of minor City facilities on national forest lands that are upstream of Dam 2 and outside the riparian area surrounding the reservoirs; 7) maintenance and repair of roads on Federal land; 8) all aspects of the City's water supply system outside the Sandy River Basin; and 9) activities by others in the Bull Run River Watershed not specifically mentioned above. For these activities, the City would comply with applicable ESA regulations on a project-by-project basis.

2.2.2.4 Covered Species

Covered species are those species that would be authorized for incidental take. The City proposes that four[1] species be covered under the Bull Run HCP, as listed in Table 2.2-3. These four species are spring and fall Lower Columbia River Chinook salmon, Lower Columbia River steelhead, Lower Columbia River coho salmon, and Columbia River chum salmon. Each of the four species meets all of the following criteria:

- The species is known to be present or has the potential to be present within the Sandy River Basin during the term of the ITP.
- The species is currently listed under the Federal ESA as threatened or endangered during the term of the ITP.
- The species has the potential to be affected by one or more of the covered activities described in Subsection 2.2.2.2, Covered Activities.

Table 2.2-3 Proposed covered species in the Bull Run HCP

Common Name	Scientific Name	Status[1]
Lower Columbia River Chinook Salmon (Spring and Fall)	*Oncorhynchus tshawytscha*	T
Lower Columbia River Steelhead	*Oncorhynchus mykiss*	T
Lower Columbia River Coho Salmon	*Oncorhynchus kisutch*	T
Columbia River Chum Salmon	*Oncorhynchus keta*	T

[1] Status Codes: T = Threatened

2.2.2.5 Species Addressed in the HCP

In addition to the four proposed covered species, the Bull Run HCP includes conservation measures and effects analyses for 18 fish and wildlife species that are not proposed for ITP coverage. Some of these species – for example, fish and amphibians – would benefit from the same measures that benefit the proposed covered species. Other species, including birds and mammals, do not depend on aquatic habitat, but occur in the Bull Run Watershed and could be affected by City activities. The additional 18 species addressed in the Bull Run HCP, but not proposed for ITP coverage, are listed in Table 2.2-4. The bald eagle was recently de-listed under the ESA, but is still protected under other Federal statutes.

Table 2.2-4 Other species addressed in the Bull Run HCP

Common Name	Scientific Name	Status[1]
Fish		
Coastal Cutthroat Trout	*Oncorhynchus clarki clarki*	SOC
Rainbow Trout	*Oncorhynchus mykiss*	None
Pacific Lamprey	*Lampetra tridentata*	SOC
River Lamprey	*Lampetra ayresi*	SOC
Western Brook Lamprey	*Lampetra richardsoni*	None
Amphibians and Reptiles		
Cope's Giant Salamander	*Dicamptodon copei*	None
Cascade Torrent Salamander	*Rhyacotriton cascadae*	None
Clouded Salamander	*Aneides ferreus*	None
Oregon Slender Salamander	*Batrachoseps wrighti*	SOC
Coastal Tailed Frog	*Asacaphus truei*	SOC
Northern Red-legged Frog	*Rana aurora aurora*	SOC
Cascades Frog	*Rana cascadae*	SOC
Western Toad	*Bufo boreas*	None
Western Painted Turtle	*Chrysemys picta belli*	None
Northwestern Pond Turtle	*Clemmys marmorata marmorata*	SOC
Birds and Mammals		
Bald Eagle	*Haliaeetus leucocephalus*	None
Northern Spotted Owl	*Strix occidentalis caurina*	T
Fisher	*Martes pennanti*	C

[1] Status Codes: T = Threatened; C = Candidate; SOC = Species of Concern

2.2.2.6 Proposed Conservation Measures

The City developed a program of proposed habitat conservation measures. Because the City's water supply system is located on the Bull Run River, the conservation measures focus on addressing the impacts of continued operations on the river. However, some impacts could not feasibly be avoided.

[1] The Bull Run HCP states that there are five covered species, differentiating between fall and spring Chinook salmon. However, this EIS states that there are four covered species because fall and spring Chinook salmon are the same species.

Consequently, the City also included conservation measures to improve conditions for the four covered species in the greater Sandy River Basin. These are considered offsite conservation measures.

The City divided the habitat conservation measures into two primary categories: the lower Bull Run River and the greater Sandy River Basin. The Bull Run HCP also includes habitat conservation measures for the two Bull Run reservoirs, water system operations, and terrestrial wildlife, and it provides for a Habitat Fund. The conservation strategy for each category is described below.

Lower Bull Run River Habitat Conservation Measures

Impacts to the lower Bull Run River occur in three general categories: river flow, water temperature, and aquatic/riparian habitat. To address these impacts, the City developed conservation measures to avoid or minimize flow and temperature impacts, and to protect and improve instream and riparian habitat. The objectives that were used to identify habitat conservation measures for the lower Bull Run River are described in Section 7.2 of the Bull Run HCP. The major elements of the conservation measures are outlined below.

Instream Flow Measures

The City developed a normal water year regime (Measure F-1) and a critical water year regime (Measure F-2) to regulate the amount and timing of flow releases from Bull Run Dam 2. Measure F-1 would be expected to occur 90 percent of the time, and Measure F-2 would be expected to occur 10 percent of the time, based on a 60-year record of flows in the Bull Run River. Measure F-1 (Table 2.2-5) includes guaranteed minimum flow amounts and other criteria to maintain flow levels for spawning, rearing, and migrating salmonids and other aquatic species. Measure F-2 (Table 2.2-6) includes guaranteed minimum flows for critical water year regimes. These flows are the same as normal water years except during periods declared as "critical" based on spring conditions (affecting June flow requirements) and/or fall conditions (affecting October through November flow requirements). Background information and additional detail is provided in Section 7.2.1 of the Bull Run HCP.

In addition to the flow releases, the City developed a measure to protect against large decreases in the river level that could trap small salmonids (Measure F-3). The City is also proposing to sign a flow agreement that would maintain natural instream flows in the Little Sandy River (Measure F-4). Because the Little Sandy is a tributary to the Bull Run River, Little Sandy flows would contribute to increasing lower Bull Run River flows. Measures F-1 through F-4 would be implemented in HCP years 1 through 50.

Table 2.2-5 Flow commitments under the Proposed Action for the Lower Bull Run River during normal water years, measured at USGS Gauge 14140000, RM 4.7

Time Period	Guaranteed Minimum Flow (cfs)[1]	Required Percent of Inflow (%)	Maximum Required Flow (cfs)
January 1 – May 31	120	Not applicable	Not applicable
June 1 – June 15	120	Not applicable	Not applicable
June 16 – June 30	Gradually decrease flows over 15 days from minimum of 120 cfs to a minimum of 35 cfs.		
July 1-September 30	Optimize use of cold water in the reservoirs. Vary flow from 20 cfs to 40 cfs to manage downstream water temperature based on weather conditions. Average summer flow expected to be 35 cfs.		
October 1 – October 15	70	50	400
October 16 – October 31	70	50	400
November 1 – November 15	150	40	400
November 16 – November 30	150	40	400
December 1 – December 31	120	Not applicable	Not applicable

[1] cubic feet per second

Table 2.2-6 Flow commitments under the Proposed Action for the Lower Bull Run River during critical water years, measured at USGS Gauge 14140000, RM 4.7

Time Period	Guaranteed Minimum Flow (cfs)[1]	Required Percent of Inflow (%)	Maximum Required Flow (cfs)
January 1 – May 31	120	Not applicable	Not applicable
June 1 – June 15	30	Not applicable	Not applicable
June 16 – June 30	30	Not applicable	Not applicable
July 1-September 30	Optimize use of cold water in the reservoirs. Vary flow from 20 cfs to 40 cfs to manage downstream water temperature based on weather conditions. Average summer flow expected to be 35 cfs.		
October 1 – October 15	20	Continue to vary flow from 20-40 cfs to manage downstream water temperature	
October 16 – October 31	30	50	250
November 1 – November 15	30	40	400
November 16 – November 30	70	40	350
December 1 – December 31	120	Not applicable	Not applicable

[1] cubic feet per second

As described under Subsection 2.2.1, Alternative 1, No-action Alternative, the City has been implementing these proposed conservation measures on an experimental basis in order to help determine the costs and operational changes that would be required if the Bull Run HCP was approved. In this sense, flow standards under Alternative 2, Proposed Action, are the same as existing conditions.

Water Temperature Measures

Water temperature measures under the Proposed Action are the same as under the No-action Alternative. To control temperatures in the lower river and in the water distribution system, the City is proposing to modify the Dam 2 intake towers for selective withdrawal. The City plans to complete design and construction of the tower modifications within the first 5 years of the Bull Run HCP (Measure T-2). Until the modifications are in place, the City would implement Measure T-1 to manage temperature. Under Measure T-1, the City would manage flow releases from the Headworks to maintain the 7-day moving average water temperature of the daily maximums at equal to or less than 69.8°F (21.0 °C). After the modifications are in place, the City would manage flow in accordance with Measure T-2 to comply fully with the TMDL requirements. Section 7.2.3 of the Bull Run HCP contains additional information on temperature control measures.

Instream and Riparian Habitat Measures

The City is proposing conservation measures for gravel augmentation, fish passage, and riparian forest protection in or along the lower Bull Run River.

- The Bull Run reservoirs trap bedload and sediment, thereby reducing gravel input to the lower river. Implementation of Measure H-1 of the HCP would replenish spawning gravel to mimic natural supply and accumulation. Measure H-1 would be implemented in HCP years 1 through 50.

- Walker Creek is the only tributary to the lower Bull Run River where a City culvert has blocked fish passage. Implementation of Measure P-1 would provide volitional fish passage into Walker Creek within the first 5 years of the HCP. Measure P-1 would be implemented in HCP years 1 through 5.

- City owned lands along the lower Bull Run River remain capable of providing riparian habitat at a level comparable to unmanaged later-seral forest. In accordance with Measure H-2, the City would continue managing these lands to maintain and improve their condition for the duration of the Bull Run HCP. Measure H-2 would be implemented in HCP years 1 through 50.

Bull Run Reservoir Habitat Conservation Measures

The City developed three habitat conservation measures to improve habitat conditions in Bull Run Reservoir 2. Measure R-1 includes specific operating criteria to avoid or minimize mortality of cutthroat and rainbow trout. Measure R-2 includes removing cutthroat trout from the Dam 2 spillway approach canal to prevent mortality caused by temperature. Measure R-3 includes removing reed canarygrass from three areas along the north bank of the upper end of Bull Run Reservoir 1 to improve habitat for amphibians. This area occurs on Mt. Hood National Forest Lands. Measures R-1 through R-3 would be implemented in HCP years 1 to 50.

Water System Operations and Maintenance Conservation Measures

The City would implement two measures to address potential impacts associated with operation and maintenance (O&M) of the water supply system: Bull Run Infrastructure Operations and Maintenance (O&M-1) and Bull Run Spill Prevention (O&M-2). Under conservation measure O&M-1, the City would prevent paint and debris from falling in the river during bridge and conduit maintenance at all active stream crossings (other than the mainstem Sandy River); avoid or minimize erosion during repair and maintenance of all water supply infrastructure; and dechlorinate water drained from conduits before it is discharged to a waterway. Under conservation measure O&M-2, the City would implement a series of measures to avoid or minimize spill effects at the Headworks facility below Bull Run Dam 2 and at the Sandy River Station, a 5.5-acre maintenance facility located next to the mainstem Sandy River. Measures O&M-1 and O&M-2 would be implemented in HCP years 1 to 50.

Sandy River Basin Habitat Conservation Measures

The City is proposing 31 offsite conservation measures to improve fish habitat in the greater Sandy River Basin. The locations of the offsite measures are shown in Figures 2.2-1 through 2.2-6. The measures include placement of large wood and boulders to create habitat; purchase of approximately 425 acres of riparian easements in the Lower Sandy River Watershed, the Middle Sandy River Watershed, the Upper Sandy River Watershed, the Salmon River Watershed, and the Zigzag River Watershed; fish passage for 5.5 miles of Alder Creek and 12 miles of Cedar Creek; and channel restoration in the Salmon River Watershed. The offsite conservation measures F-5, H-3 through H-29, and P-2 through P-4 are listed below. Section 7.5 of the Bull Run HCP provides more information on each of the offsite habitat conservation measures.

- F-5 Cedar Creek Purchase Water Rights
- H-3 Little Sandy 1 and 2 Large Wood Placement

- H-4 Sandy 1 and 2 Log Jam Placements
- H-5 Gordon 1A and 1B Large Wood Placement
- H-6 Trout 1A Large Wood Placement
- H-7 Trout 2A Large Wood Placement
- H-8 Sandy 1 Reestablishment of River Mouth
- H-9 Sandy 1 Channel Reconstruction
- H-10 Sandy 1 Turtle Survey and Relocation
- H-11 Sandy 1 Riparian Easement and Improvement
- H-12 Sandy 2 Riparian Easement and Improvement
- H-13 Gordon 1A and 1B Riparian Easement and Improvement
- H-14 Sandy 3 Riparian Easement and Improvement
- H-15 Cedar 2 and 3 Riparian Easement and Improvement
- H-16 Alder 1A and 2 Riparian Easement and Improvement
- H-17 Cedar 2 and 3 Large Wood Placement
- H-18 Sandy 8 Riparian Easement and Improvement
- H-19 Salmon 1 Riparian Easement and Improvement
- H-20 Salmon 2 Riparian Easement and Improvement
- H-21 Salmon 3 Riparian Easement and Improvement
- H-22 Boulder 1 Riparian Easement and Improvement
- H-23 Salmon 2 Miller Quarry Acquisition
- H-24 Salmon 2 Miller Quarry Restoration
- H-25 Salmon 2 Carcass Placement
- H-26 Boulder 0 and 1 Large Wood Placement

- H-27 Zigzag 1A Channel Design
- H-28 Zigzag 1A and 1B Riparian Easement and Improvement
- H-29 Zigzag 1A,1B, and 1C Carcass Placement
- P-2 Alder 1 Fish Passage
- P-3 Alder 1A Fish Passage
- P-4 Cedar Creek 1 Fish Passage

Terrestrial Wildlife Habitat Conservation Measures

In addition to conservation measures targeting the four covered species, the City is proposing three conservation measures to minimize impacts to spotted owls, bald eagles, and fishers, as outlined in Section 7.7, Terrestrial Wildlife Habitat Conservation Measures, of the Bull Run HCP.

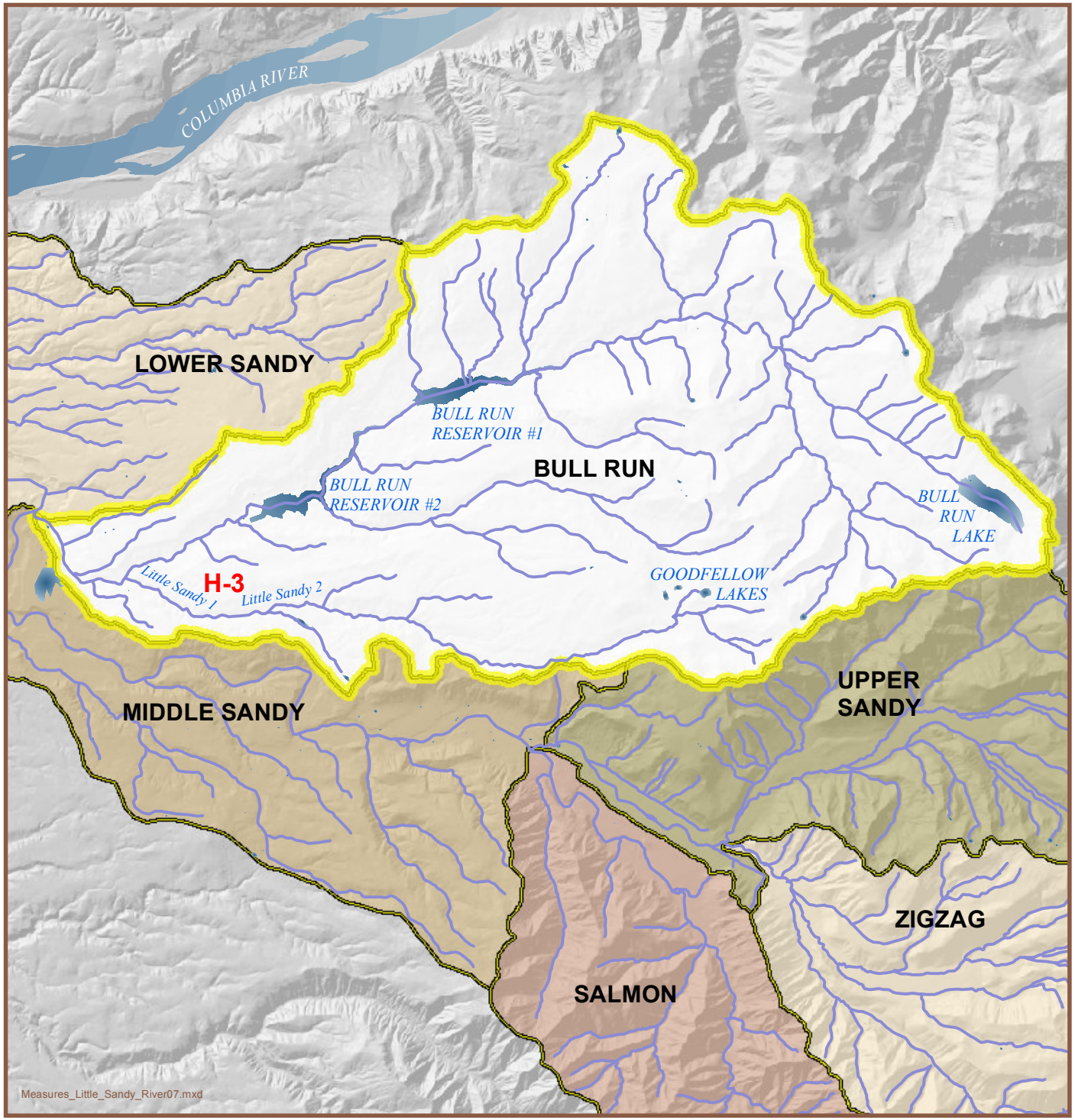
Habitat Fund

The City would use a portion of the Bull Run HCP funding to contribute to projects implemented in coordination with the Sandy River Basin Partners, thereby contributing to larger-scale restoration in the Sandy River Basin. The Habitat Fund (HCP Measure H-30) would total $9 million. A $5 million portion of the Habitat Fund would be available in four increments prior to HCP Year 20 and would be dedicated to partnership projects. Of the $5 million, the City would specifically dedicate $1.7 million toward habitat enhancement projects on the Salmon River to be implemented jointly by the Sandy River Basin Partners, and with additional funds from the Partners and/or from grants. If partnership funds cannot be obtained to implement these projects, the City funds would be used for other projects in the Sandy River Basin. The remaining $4 million would be dedicated to adaptive management. If the $4 million were not needed for adaptive management, it would be used for partnership projects. Projects would be selected in consultation with the HCP Implementation Committee and would be guided by the Sandy River Basin Restoration Strategy. The City and NMFS would make the final project selection decisions. Details of the Habitat Fund, such as project selection criteria and funds allocation, are available in Section 7.6 of the Bull Run HCP.

2.2.2.7 Monitoring, Research, and Adaptive Management Programs

Monitoring

The City has identified measurable habitat objectives for each conservation measure. Compliance would be monitored and documented for all the conservation measures (Section 9.2.1 of the Bull Run



Key Boundaries

Watersheds of the Sandy River Basin

Bull Run River Watershed

Rivers and Streams

HCP Offsite Measures

H-3 LW Placement

Measure symbols are placed to indicate general river reach areas rather than in the exact location of the measure. Exact locations depend on willing landowner participation.

N

Projection:
State Plane Oregon North
North American Datum 1983

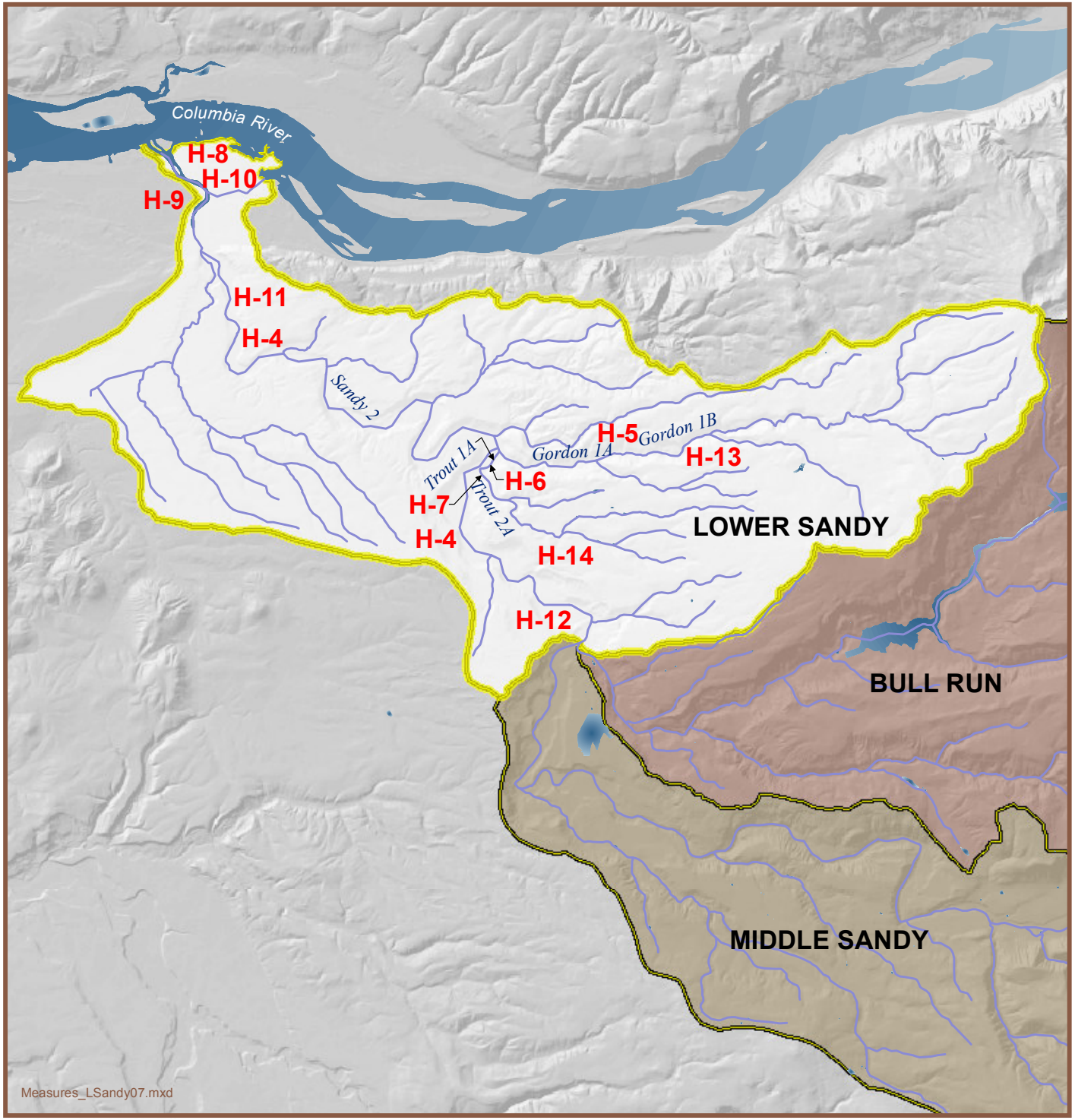
1:210,310

Miles
0 0.5 1 2 3 4 5

Kilometers
0 1.25 2.5 5 7.5 10

Figure 2.2-1
Offsite Conservation Measures
in the Little Sandy River

ES042007003SAC Figure_2.2-1.ai 07/26/2007 afint



Key Boundaries

- Watersheds of the Sandy River Basin
- Lower Sandy River Watershed
- Rivers and Streams

HCP Offsite Measures

- **H-4** Log Jam Placement
- **H-5, H-6, H-7** Large Wood Placement
- **H-8** Reestablishment of River Mouth
- **H-9** Channel Reconstruction
- **H-10** Turtle Survey & Relocation
- **H-11, H-12, H-13** Riparian Improvement

Measure numbers are placed in general river reach areas rather than in the exact location of the measure. Exact locations depend on willing landowner participation.

N

Projection:
StateP lane Oregon North
North American Datum 1983

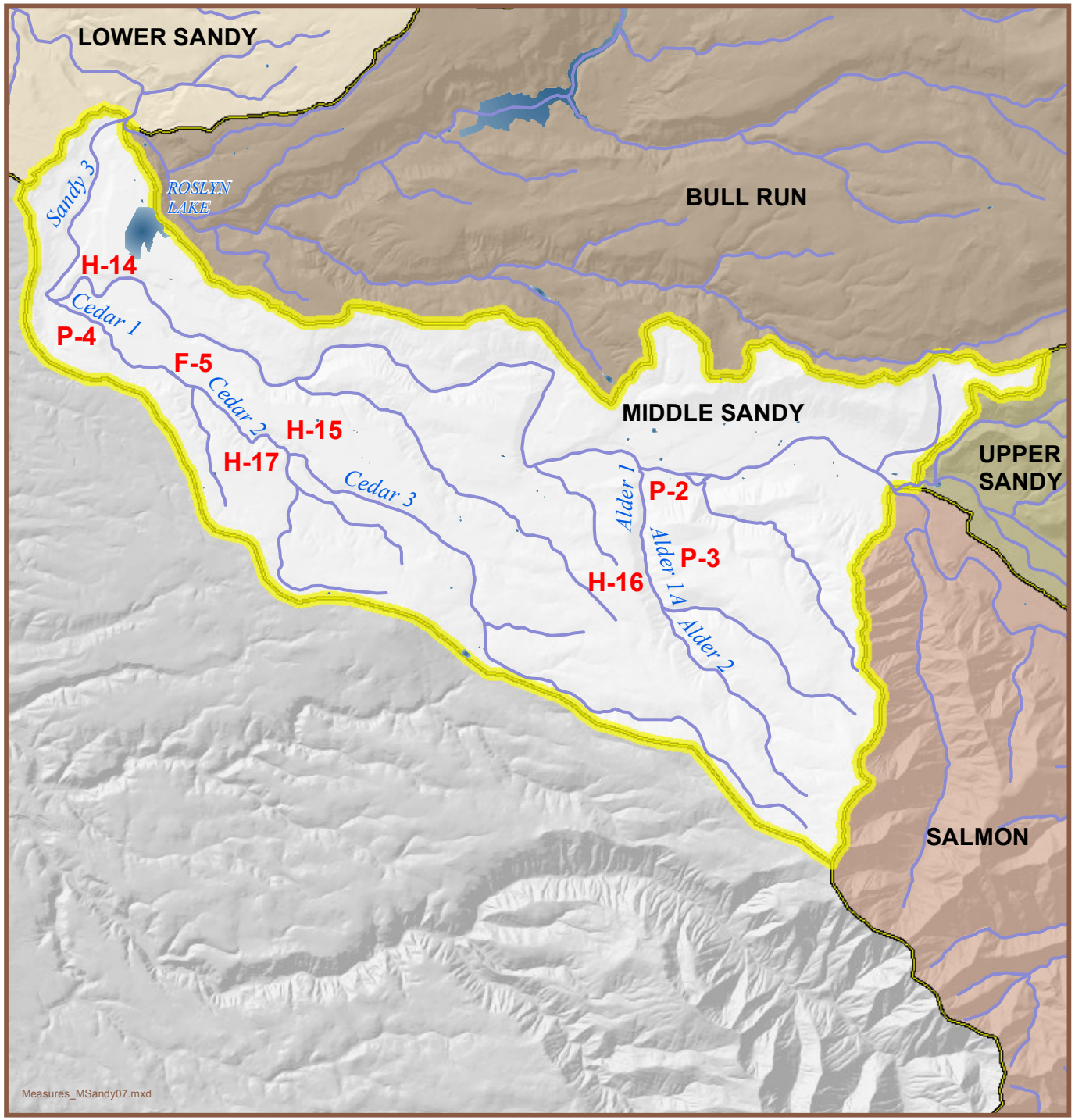
1:169,062

Miles
0 0.5 1 2 3 4 5

Kilometers
0 1 2 4 6 8 10

Figure 2.2-2
Offsite Conservation Measures in the Lower Sandy River Watershed

ES042007003SAC Figure_2.2-2.ai 07/26/2007 afint



Key Boundaries

- Watersheds of the Sandy River Basin
- Middle Sandy River Watershed
- Rivers and Streams

HCP Offsite Measures

- **F-5** Purchase Water Rights
- **H-14, H-15, H-16** Riparian Improvement
- **H-17** Large Wood Placement
- **P-2, P-3, P-4** Fish Passage

Measure numbers are placed to indicate general river reach areas rather than in the exact location of the measure. Exact locations depend on willing landowner participation.

N

Projection:
State Plane Oregon North
North American Datum 1983

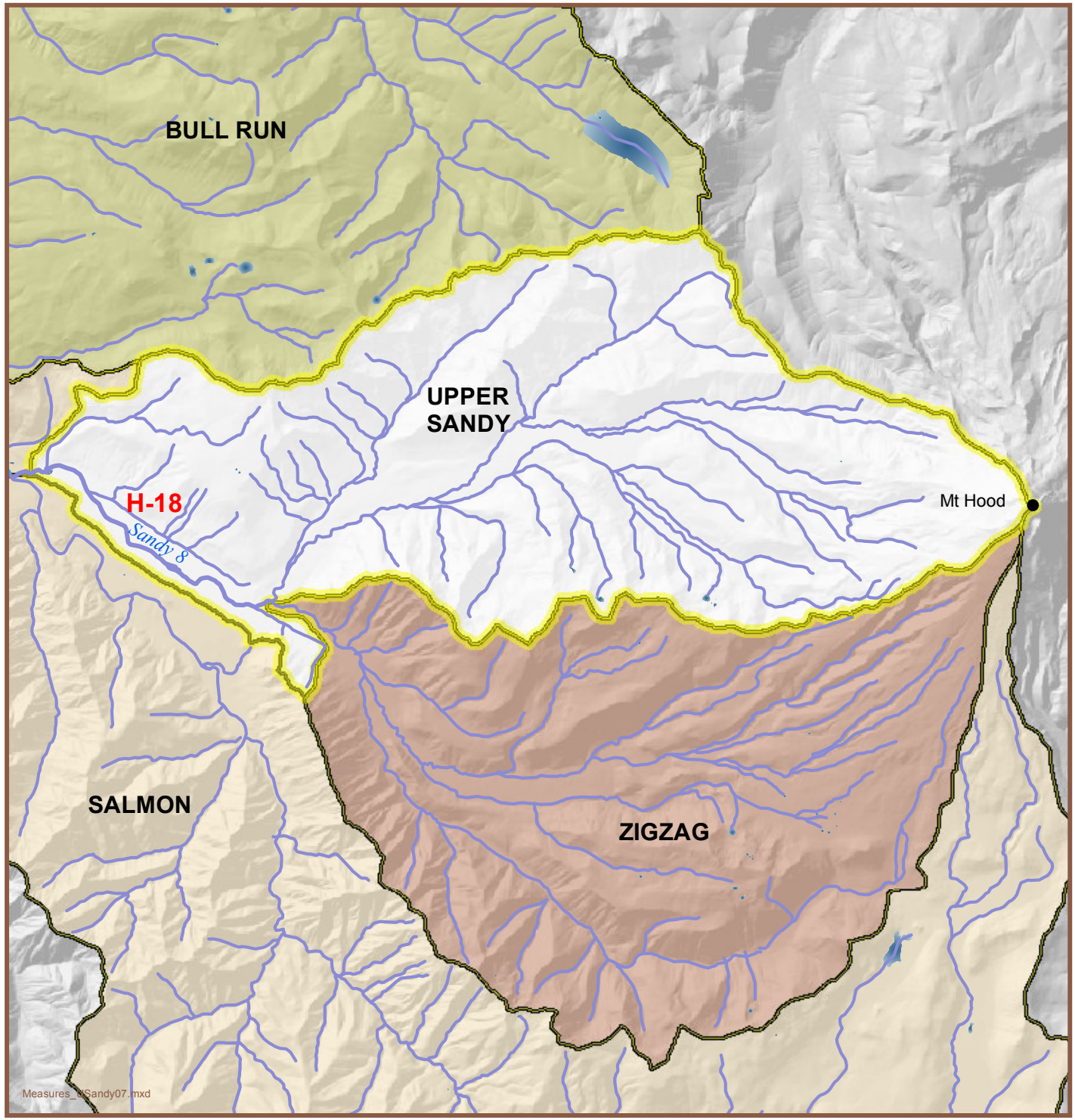
1:135,256

Miles
0 0.5 1 2 3 4 5

Kilometers
0 1 2 4 6 8

Figure 2.2-3
Offsite Conservation Measures in the Middle Sandy River Watershed

ES042007003SAC Figure_2.2-3.ai 07/26/2007 afint



Key Boundaries

Watersheds of the Sandy River Basin

Upper Sandy River Watershed

Rivers and Streams

HCP Offsite Measures

H-18 Riparian Improvements

Measure symbols indicate general reach locations rather than the precise implementation site.

N

Projection:
StatePlane_Oregon_North_FIPS_3601
North American Datum 1983

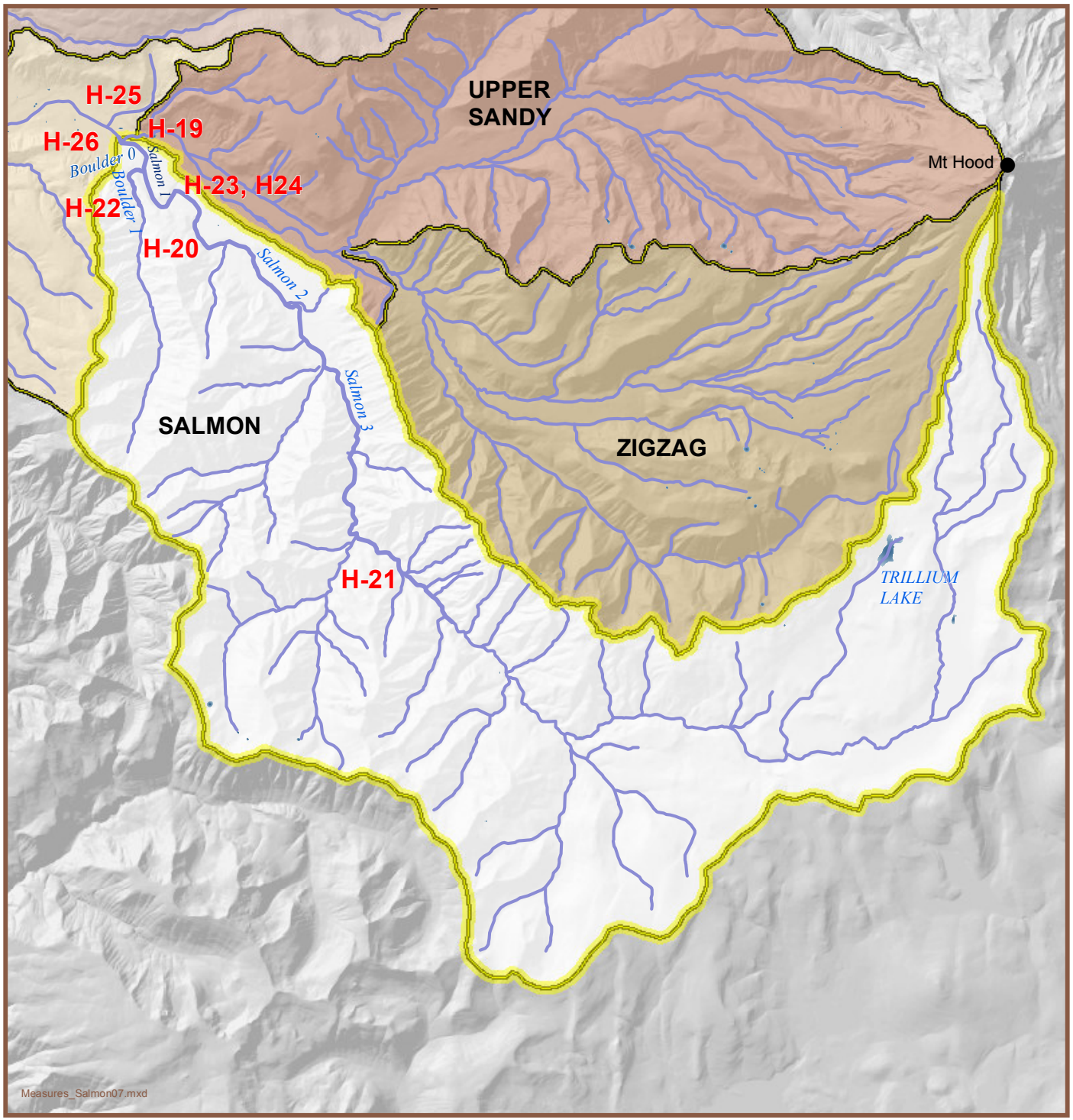
1:157,353

Miles
0 0.5 1 2 3 4 5

Meters
0 1,000 2,000 4,000 6,000 8,000

Figure 2.2-4
Offsite Conservation Measures in the Upper Sandy River Watershed

ES042007003SAC Figure_2.2-4.ai 07/26/2007 afint



Key Boundaries

- Watersheds of the Sandy River Basin
- Salmon River Watershed
- Rivers and Streams

HCP Offsite Measures

- **H-19, H-20, H-21, H-22** Riparian Improvements
- **H-23** Miller Quarry Acquisition
- **H-24** Miller Quarry Restoration
- **H-25** Carcass Placement
- **H-26** Large Wood Placement

Measure symbols indicate general reach locations rather than the precise implementation site.

N

Projection:
StatePlane_Oregon_North_FIPS_3601
North American Datum 1983

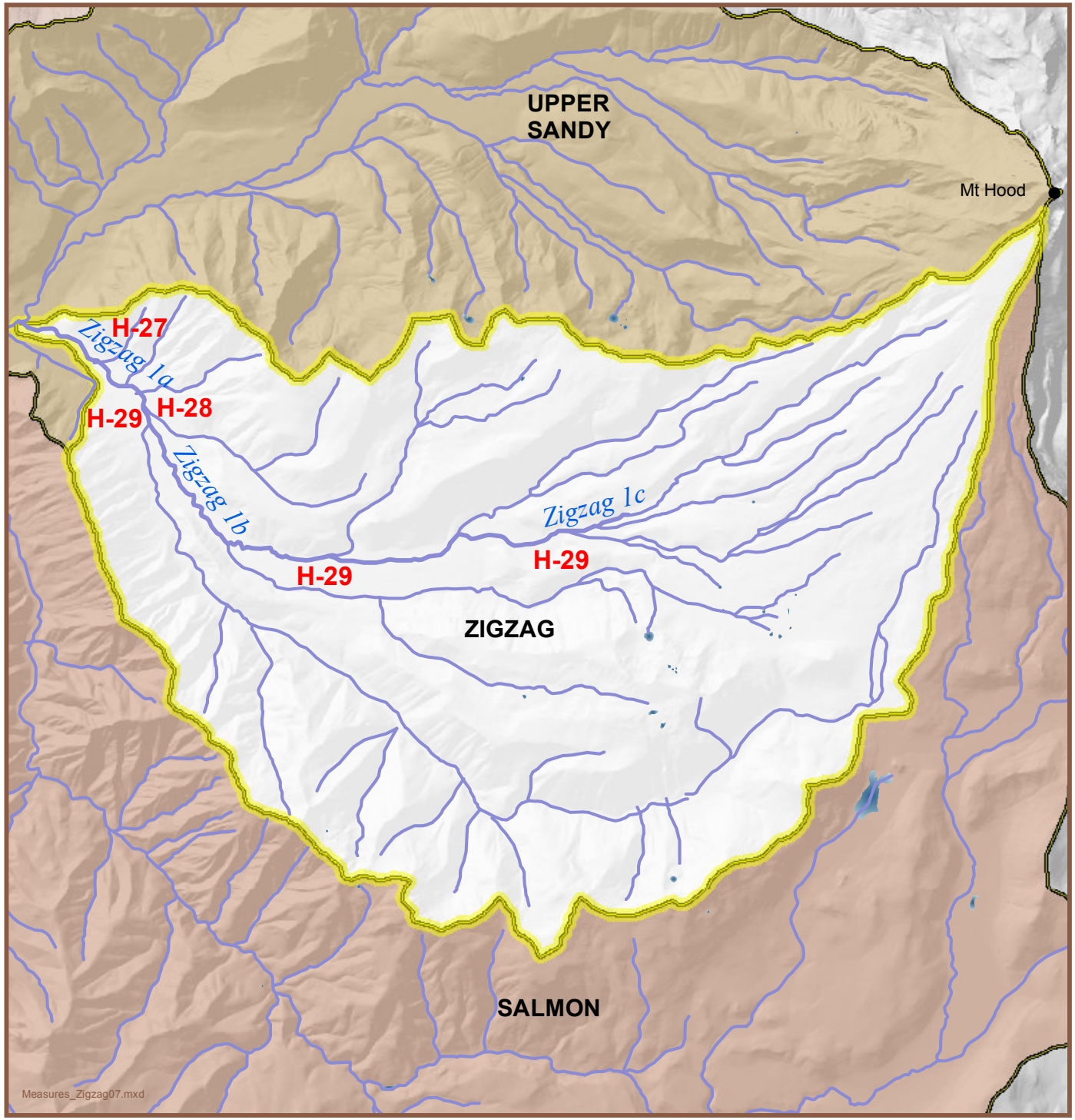
1:180,934

Miles
0 0.5 1 2 3 4 5

Meters
0 1,250 2,500 5,000 7,500 10,000

Figure 2.2-5
Offsite Conservation Measures in the Salmon River Watershed

ES042007003SAC Figure_2.2-5.ai 07/26/2007 afint



Key Boundaries

Watersheds of the Sandy River Basin

Zigzag River Watershed

Rivers and Streams

HCP Offsite Measures

H-27 Channel Design

H-28 Riparian Improvements

H-29 Carcass Placement

Measure symbols indicate general reach locations rather than the precise implementation site.

N

Projection:
StatePlane_Oregon_North_FIPS_3601
North American Datum 1983

1:115,778

Miles
0 0.5 1 2 3 4

Meters
0 875 1,750 3,500 5,250 7,000

Figure 2.2-6
Offsite Conservation Measures in the Zigzag River Watershed

ES042007003SAC Figure_2.2-6.ai 07/26/2007 afint

HCP). In addition, effectiveness monitoring would be undertaken for those measures that present some degree of uncertainty about their biological effectiveness, such as gravel placement and instream habitat enhancement (Section 9.2.2 of the Bull Run HCP).

Research

The City would implement four research components in the Bull Run Watershed and one research component in the greater Sandy River Basin. In the Bull Run River, the City would study placement of spawning gravel, degree of Chinook spawning gravel scour, concentrations of total dissolved gases, and abundance of spawning Chinook adults. In the Sandy River Basin, the City would collaborate with the Oregon Department of Fish and Wildlife (ODFW), Mt. Hood National Forest, Bureau of Land Management (BLM), and ODEQ to measure the number of juvenile salmonid outmigrants. Section 9.3 of the Bull Run HCP provides more detailed information about the research components.

Adaptive Management Program

The proposed Bull Run HCP includes provisions to select, fund, and implement additional conservation measures if the prescribed conservation measures do not achieve the results necessary to maintain compliance with ESA section 10 requirements. This adaptive management program is described in detail in Section 9.4 of the Bull Run HCP.

2.2.2.8 Changed Circumstances

The proposed Bull Run HCP contains provisions for changed circumstances – conditions that substantially change during the term of the HCP that might warrant changes in the conservation strategy. Chapter 10 of the Bull Run HCP describes four categories of changed circumstances and the anticipated response by the City and NMFS to address these changes if necessary. It is expected that, with implementation of the response measures, incidental take coverage would continue to be provided for the covered activities.

- Long term changes in the hydrology of the Bull Run River could occur as a result of global climate change. The City would study reservoir inflow data in 2025 (and every 5 years thereafter) and employ statistical analyses to determine if significant changes have occurred. If significant changes are documented, the City would participate in good faith discussions with NMFS to review the HCP flow measures. The objective of the discussions would be to continue meeting the terms of the HCP under a new hydrologic regime, if feasible.

- Similar to the above, long term changes in climatic conditions could affect the City's ability to meet temperature standards. If that occurs, the City would enter into good faith discussions with NMFS and the ODEQ to review the HCP flow and temperature measures. Possible outcomes could include changes to the flow and temperature measures.

- A significant decrease in the quantity or quality of fish habitat within the Sandy River Basin could alter the overall status of one or more covered species, as well as the relative impact of incidental take associated with the water supply system. In the event of such a change, the City and NMFS would enter into good faith discussions to explore available response options, such as additional habitat restoration actions.

- NMFS might list additional species as threatened or endangered under the ESA, delist species that are currently listed, or declare a listed species extinct. If one of these changed circumstances occurs, the City would take various response actions leading to the addition of species and conservation measures to the HCP, or deletion of species and conservation measures from the HCP. The City and NMFS would enter into good faith discussions to develop the appropriate response actions.

2.2.3 Alternative 3, Fish Passage Alternative

Under Alternative 3, the City would provide upstream and downstream fish passage facilities at Bull Run Dam 1 and Bull Run Dam 2. The characteristics of these facilities are summarized below and described in more detail in Appendix B, Bull Run Fish Passage Alternative Technical Memorandum. This alternative also includes the lower Bull Run River conservation measures for temperature (Measures T-1 and T-2) and flow (Measures F-1 through F-3); the terrestrial wildlife conservation measures (W-1, W-2, W-3); and the Bull Run habitat measures (O&M-1 and O&M-2; R-1 through R-3; P-1; F-4; and H-1 and H-2) to address potential impacts associated with operation and maintenance of the water supply system, described in Subsection 2.2.2.6, Proposed Conservation Measures. Because the offsite conservation measures under the Proposed Action are designed in part to compensate for blocking access to habitat upstream of Bull Run Dam 2, those measures are not included under the Fish Passage Alternative. Additionally, Alternative 3 does not include any of the monitoring, research, or adaptive management programs under the Proposed Action.

The City would install the first upstream fish passage facility, the Rock Weir Fish Collection and Transportation Facility, at the rock weir located below the spillway stilling basin of Dam 2. It would include a fishway and trap located at the existing 15-foot-high rock weir structure. Fish would enter the

fishway, ascend to the trap, be crowded into a hopper, and then be placed into a truck for transportation past Dam 2. The water supply necessary to operate the facility would flow by gravity from the stilling basin.

The City would install the second upstream fish passage facility, Bull Run Dam 1 Fish Collection and Transportation Facility, on the right bank of the river immediately downstream of the powerhouse tailrace. It would operate similar to the proposed Rock Weir Facility described above. An estimated 10 pools would be required to enable migrating adults to ascend high enough to be trapped above the flood stage. A gravity water supply is not available to run this facility, so all of the necessary water would be pumped from the tailrace. A tailrace barrier may be required to prevent fish from being falsely attracted to the powerhouse tailrace or outlet works on the left bank.

The City would install downstream fish passage facilities in Bull Run Reservoir 1. The facility would include a floating surface collector with guide nets mounted on a floating barge in the reservoir, using low head pumps to create attraction flows. The fish would then be routed into a pipe to a fish transfer facility moored to the face of the dam. A crane on the deck of the dam would be used to load fish into trucks, and collected fish would be placed back into the river downstream of Bull Run Dam 2. The City also would install a downstream fish passage facility at Dam 2. This facility would be similar to the Dam 1 facility described above.

2.3 Alternatives Considered, but not Carried Forward

The process of developing a reasonable range of alternatives generated a broad range of ideas for meeting the purpose and need for this project. Three other alternatives were considered, but they are not analyzed in the EIS because they did not meet the specified purpose and need for the project. These alternatives are briefly described in the following subsections, including the reasons that they were eliminated from further consideration.

2.3.1 Bull Run Groundwater

This concept includes developing a groundwater supply below the Headworks facility at Dam 2, and discharging the pumped groundwater into the Bull Run River in the summer months to lower water temperatures. The concept was proposed in the July 11, 2006 scoping comments by the Portland Utility Review Board (the board). In its comments, the board indicated that this would obviate the need for additional releases from the two Bull Run reservoirs and for the proposed multi-tier intake at Dam 2. In addition to the development and use of groundwater, this concept would restrict placement of

spawning gravel in the lower Bull Run River within the Bull Run Management Unit and would require tree planting along the portion of the Little Sandy River outside of the Bull Run Management Unit. All other measures from the Proposed Action would be implemented.

The Portland Utility Review Board's concept was studied in detail (see Appendix C, Bull Run Groundwater-based Alternative Technical Memorandum). Based on the evaluation, the groundwater concept is not being carried forward in this EIS. Groundwater temperatures are not sufficiently cold to achieve the required river temperatures. Groundwater at approximately 55.4 to 57.2°F (13 to 14°C) would create river temperatures above the required conditions at the measurement point (Larson's Bridge) under most conditions (approximately 75 percent of the time). Therefore, this alternative was not carried forward because it did not meet the purpose and need of the project. Specifically, this alternative would not comply with state water quality standards and TMDL designations for the Bull Run River and Sandy River Basin.

2.3.2 Dam Removal

Access to habitat above the dams could be provided by removal of Bull Run Dams 1 and 2. This alternative would require demolition of the two dams, as well as programs to manage sediment and construction debris. Extensive habitat restoration to recreate the prior riparian and instream habitat values in the reservoir areas would also be included. This concept was not carried forward for detailed evaluation because of the limited benefit for fish and the requirement to develop alternative water sources to provide public water supply. This would be contrary to the purpose and need of ensuring an adequate long term water supply.

Fish habitat models show limited production from the upper reaches of the Bull Run River (Tappel 1998; City of Portland 2004a; CH2M HILL 2005). In addition, fish production in the upper Bull Run River has historically been limited by high temperature (City of Portland 2004a). Offsite conservation measures would not be implemented under this alternative.

2.3.3 Fish Ladders

Access to habitat above the two Bull Run dams could potentially be achieved through the installation of fish ladders, which would provide volitional passage for upstream migrating adult fish. However, it is anticipated that fish ladders would be much more expensive and less effective than the trap-and-haul concept proposed in Alternative 3. This assessment is attributed to the height of the existing dams, the large fluctuations in the reservoir forebay water surface elevations, water quality concerns, and the

significant cost of providing volitional fish passage facilities. It is assumed that this alternative would provide downstream passage for juvenile fish via floating surface collectors, similar to Alternative 3.

The heights of Bull Run Dams No. 1 and No. 2 (180 and 145 ft., respectively), are well above the maximum effective height for fish ladders of approximately 80 to 100 feet. In addition, the fishway entrance at Bull Run Dam No. 2 would have to be located below the Rock Weir, necessitating an additional elevation gain of approximately 70 feet and a much longer fishway. The fishway for Bull Run Dam No. 2 would be approximately 4,000 feet in length and the fishway for Bull Run Dam No. 2 would be approximately 2,000 feet in length, assuming a 1-foot vertical drop per pool. In Oregon, both high and long fish ladders have had limited success as demonstrated at the Portland General Electric (PGE) Pelton Ladder on the Deschutes River (188 ft. tall and 2.8 mi. long), and the PGE Faraday/North Fork ladder on the Clackamas River (196 ft. tall and 1.9 mi. long) (Personal communication, Don Ratliffe, Senior Fisheries Biologist, PGE). Fish often become delayed and/or fall back in fishways of this magnitude, resulting in reduced fish passage.

The large fluctuations in the reservoir forebay water surface elevations for Bull Run Reservoirs No. 1 and No. 2 (90 and 20 ft., respectively) would require the fishway exits to have special provisions to safely deliver fish into the upstream reservoir. These modifications provisions may include large penetrations through the dams with adjustable weirs and multiple fishway exits, or alternatively, false weirs, return chutes, and water supply pump stations. The pump stations would be required to function over the full range of reservoir forebay water surface elevations. These facilities would greatly increase the already high cost of the volitional fish ladder fishways.

Water quality concerns, such as temperature and dissolved oxygen, would also limit the effectiveness of the fish ladder alternative. Water for the fishways would be provided from a combination of sources – tailrace pump stations, forebay pump stations, and gravity water supplies. As such, special provisions would be needed to ensure adequate temperature and dissolved oxygen profiles, including intakes that utilize existing temperature towers, new deep water intakes, and packed aeration columns. In addition to their high costs, these facilities may also deplete the cold water supply in the reservoirs, impacting downstream water quality and making it difficult to meet downstream temperature requirements. The long length of the required fish ladder fishways would also increase the risk of high water temperatures due to solar heating. Higher water temperatures would make the fishways less attractive to migrating fish.

The fishways would require a maximum ladder flow of approximately 30 cfs and a maximum attraction water supply (AWS) flow of approximately 80 cfs. Minimum fishway flows would be equivalent to

instream flow requirements. While drinking water supplies would likely not be affected, there may be hydropower generation impacts.

The provision of volitional fish ladders and gulpers at Bull Run No. 1 and Bull Run No. 2 would cost approximately $150 million. This high cost is due to both the length and height of the required ladders, as well as the additional facilities required to make them operate successfully. This cost does not include monitoring and evaluation facilities. In comparison, the Alternative 3 trap-and-haul and gulper fish passage concept would cost approximately $50 million dollars. The trap-and-haul concept would also likely provide more effective upstream passage.

The NOAA Fisheries 2004 Anadromous Salmonid Passage Facility Guidelines and Criteria states that *"In general, NOAA Fisheries requires volitional passage, as opposed to trap and haul, for all passage facilities. This is primarily due to the risks associated with the handling and transport of migrant salmonids, in combination with the long term uncertainty of funding, maintenance and operation of the trap and haul program. However, there are instances in which trap and haul may be the only viable option for upstream and/or downstream fish passage at a particular site."* As such, the volitional fish ladder alternative was not carried forward because it does not meet the purpose and need for the project. Specifically, this alternative would not provide cost-effective minimization and mitigation measures for the incidental take of species listed by NOAA Fisheries.

Table 2.2-1 Comparison of alternatives

Category	No-action Alternative	Proposed Action	Fish Passage
Flow – Normal Year	The City would manage flows to facilitate implementation of the TMDL during the summer/early fall period. Flows in Measure F-1 would be provided from June through October, which can be described as partial implementation of HCP Measure F-1.	The City would manage flows to facilitate implementation of the temperature standards in the same manner as under the No-action Alternative. In addition, the City would implement additional flow standards to maintain minimum flows for spawning, rearing, and migrating salmonids and other aquatic species. See HCP Measure F-1.	Same as Proposed Action.
Flow – Critical Year	The City would manage flows similar to the normal year regime, but flow would be reduced to account for critical spring and/or fall seasons. Flows in Measure F-2 would be provided from June through October.	The City would manage flows similar to the normal year regime, but flow would be reduced to account for critical spring and/or fall seasons. See HCP Measure F-2.	Same as Proposed Action.
Flow – Downramping	No new downramping commitments for fish.	The City would reduce flows in a manner that would minimize adverse effects on juvenile salmonids. See HCP Measure F-3.	Same as Proposed Action.
Temperature Management – Prior to Infrastructure Improvements	The City would manage the available cold water in the reservoirs to control temperatures in the lower Bull Run River and also in the water distribution system until the multi-tier intake is in place. See HCP Measure T-1 and Appendix G of the Bull Run HCP.	Same as No-action Alternative.	Same as No-action Alternative.

Table 2.2-1 Comparison of alternatives, continued

Category	No-action Alternative	Proposed Action	Fish Passage
Temperature Management – Following Infrastructure Improvements	When the multi-tier intake is in place, the City would manage water temperatures to fully comply with TMDL requirements. See HCP Measure T-2 and Appendix G of the Bull Run HCP.	Same as No-action Alternative.	Same as No-action Alternative.
Bull Run Habitat Conservation Measures	None.	The City would implement measures to address the impacts of continued operations on the Bull Run River, including for general operations and maintenance, reservoir operations, and habitat improvements (measures F-4; P-1; O&M-1 and O&M-2; R-1 through R-3, and H-1 and H-2).	Same as Proposed Action.
Offsite Conservation Measures	None.	The City would implement measures to improve conditions for listed species in the greater Sandy River Basin (measures F-5; P-2 through P-4; and H-3 through H-29).	None.
Habitat Fund Measure	None.	The City would implement measure H-30 to provide funding for projects implemented in coordination with Sandy River Basin Partners, thereby contributing to larger-scale restoration.	None.
Terrestrial Wildlife Measures	None.	The City would implement the three avoidance measures to minimize impacts to spotted owls, bald eagles, and fishers (measures W-1, W-2, W-3).	Same as Proposed Action.
Fish Passage Facilities Upstream of Bull Run Dams 1 and 2.	None.	None.	The City would provide upstream and downstream fish passage facilities at Bull Run Dam 1 and Dam 2.